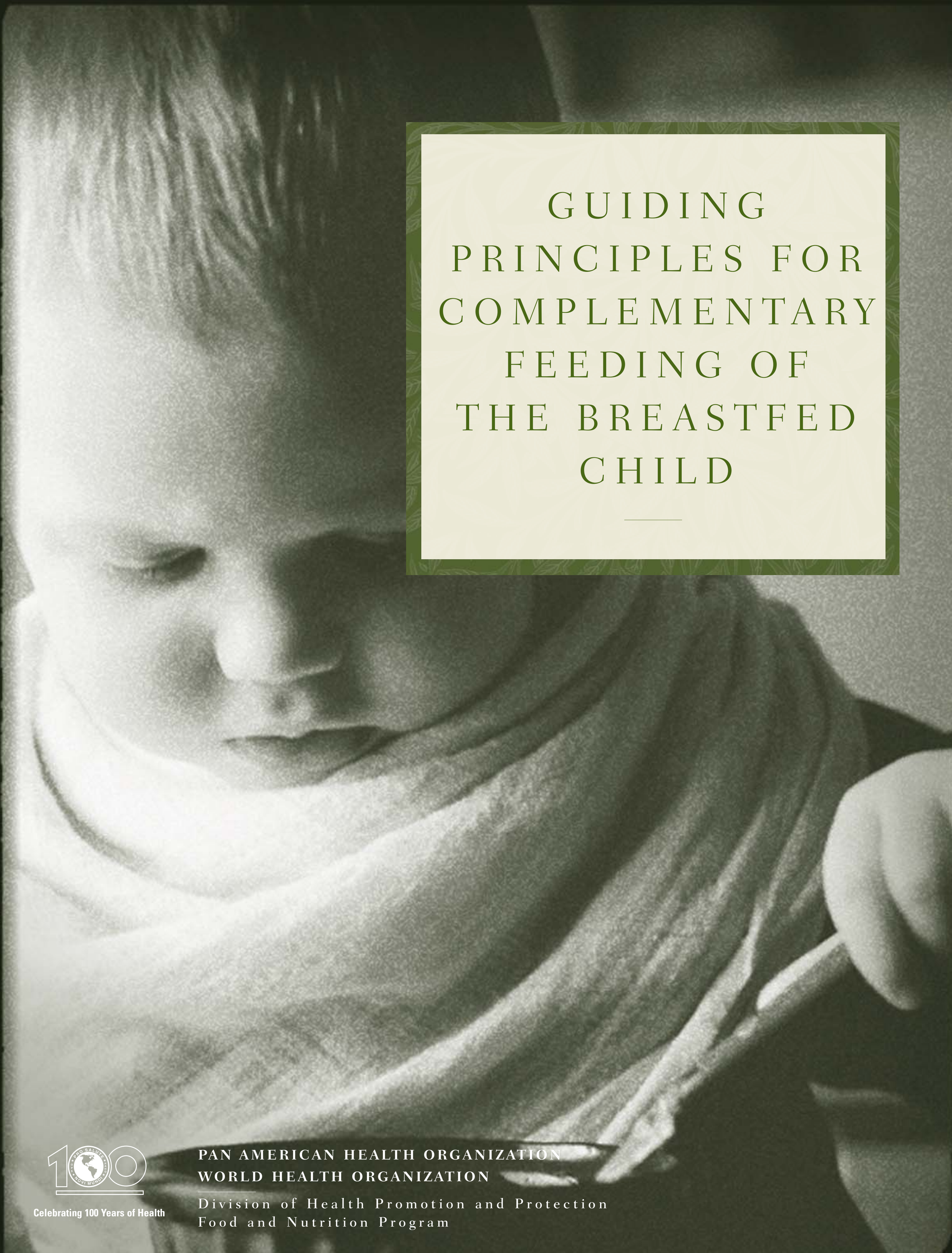


GUIDING PRINCIPLES FOR COMPLEMENTARY FEEDING OF THE BREASTFED CHILD

Celebrating 100 Years of Health

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Division of Health Promotion and Protection
Food and Nutrition Program

GUIDING PRINCIPLES FOR COMPLEMENTARY FEEDING OF THE BREASTFED CHILD

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TABLES

INTRODUCTION

Adequate nutrition during infancy and early childhood is fundamental to the development of each child's full human potential. It is well recognized that the period from birth to two years of age is a "critical window" for the promotion of optimal growth, health and behavioral development. Longitudinal studies have consistently shown that this is the peak age for growth faltering, deficiencies of certain micronutrients, and common childhood illnesses such as diarrhea. After a child reaches 2 years of age, it is very difficult to reverse stunting that has occurred earlier (Martorell et al., 1994). The immediate consequences of poor nutrition during these formative years include significant morbidity and mortality and delayed mental and motor development. In the long-term, early nutritional deficits are linked to impairments in intellectual performance, work capacity, reproductive outcomes and overall health during adolescence and adulthood. Thus, the cycle of malnutrition continues, as the malnourished girl child faces greater odds of giving birth to a malnourished, low birth weight infant when she grows up. Poor breastfeeding and complementary feeding practices, coupled with high rates of infectious diseases, are the principal proximate causes of malnutrition during the first two years of life. For this reason, it is essential to ensure that caregivers are provided with appropriate guidance regarding optimal feeding of infants and young children.

The target age range for complementary feeding is generally taken to be 6 to 24 months of age, even though breastfeeding may continue beyond two years.

Complementary feeding is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other foods and liquids are needed, along with breast milk. The target age range for complementary feeding is generally taken to be 6 to 24 months of age, even though breastfeeding may continue beyond two years. A review of feeding guidelines promoted by various national and international organizations has shown that there are inconsistencies in the specific recommendations for feeding infants and young children (Dewey, in press). Some of the feeding guidelines are based more on tradition and speculation than on scientific evidence, or are far more prescriptive than is necessary regarding issues such as the order of foods introduced and the amounts of specific foods to be given. To avoid confusion, a set of unified, scientifically based guidelines is needed, which can be adapted to local feeding practices and conditions.

The guidelines described herein were developed from discussions at several technical consultations and documents on complementary feeding (WHO/UNICEF, 1998; WHO/UNICEF Technical Consultation on Infant and Young Child Feeding, 2000; WHO Global Consultation on Complementary Feeding, 2001; Academy for Educational Development, 1997; Dewey and Brown, 2002). The target group for these guidelines is breastfed children during the first two years of life. This document does not cover specific feeding recommendations for non-breastfed children, although many of the guidelines are also appropriate for such children (except for the recommendations regarding meal frequency and nutrient content of complementary foods). Appropriate diets for children who are not breastfed (such as those of HIV-positive mothers who choose not to breastfeed), often referred to as "replacement feeding", are the subject of other documents (WHO/UNICEF HIV and Infant Feeding Counseling: A training Course, 2000). It should also be noted that the guidelines herein apply to normal, term infants (this includes low birth weight infants born at › 37 weeks gestation). Infants or children recovering from acute malnutrition or serious illnesses may need specialized feeding, which is covered by clinical manuals (for example, the WHO manual "Management of the Child with a Serious Infection or Severe Malnutrition", 2000). Preterm infants may also need special feeding. However, the guidelines in this document can be used as the basis for developing recommendations on complementary feeding for these subgroups.



one

DURATION OF EXCLUSIVE BREASTFEEDING AND AGE OF INTRODUCTION OF COMPLEMENTARY FOODS

A. Guideline: Practice exclusive breastfeeding from birth to 6 months of age, and introduce complementary foods at 6 months of age (180 days) while continuing to breastfeed.

B. Scientific rationale: In May, 2001 the 54th World Health Assembly urged Member States to promote exclusive breastfeeding for six months as a global public health recommendation (World Health Assembly, 2001). This recommendation followed a report by a WHO Expert Consultation on the Optimal Duration of Exclusive Breastfeeding (WHO, 2001), which considered the results of a systematic review of the evidence (Kramer and Kakuma, 2002) and concluded that exclusive breastfeeding for six months confers several benefits on the infant and the mother. Chief among these is the protective effect against infant gastrointestinal infections, which is observed not only in developing country settings but also in industrialized countries (Kramer et al., 2001). There is some evidence that motor development is enhanced by exclusive breastfeeding for six months (Dewey et al., 2001), but more research is needed to confirm this. For the mother, exclusive breastfeeding for six months prolongs the duration of lactational amenorrhea and accelerates weight loss (Dewey et al., 2001). A longer duration of amenorrhea is generally considered an advantage, and for overweight women, weight loss is also beneficial. Weight loss may be a disadvantage for underweight women, but could be avoided by ensuring that such women have access to an adequate diet.

The Expert Consultation observed that, on a population basis, there is no adverse effect of exclusive breastfeeding for six months on infant growth. The nutrient needs of full-term, normal birth weight infants typically can be met by human milk alone for the first 6 months if the mother is well nourished (WHO/UNICEF, 1998). However, in certain circumstances, some of the micronutrients may become limiting before 6 months. In the case of iron, the infant's reserves at birth play a major role in determining the risk for anemia during infancy because the iron concentration of human milk is low. Normal birth weight infants whose mothers had good prenatal iron status usually have adequate liver iron reserves, and thus the risk of iron deficiency before six months is low. Low birth weight infants are at much greater risk for iron deficiency, and for that reason it is advised that they receive medicinal iron drops beginning at 2 or 3 months of age (UNICEF/UNU/WHO/MI Technical Workshop, 1999). Infants of mothers with prenatal iron deficiency may also be at risk, even if their birth weight is normal. For prevention of iron deficiency among infants at risk prior to six months, complementary foods are not likely to be as effective as medicinal iron drops (Dewey et al., 1998; Domellof et al., 2001).

Other nutrients that may become limiting before 6 months include zinc and certain vitamins. The zinc concentration of human milk is relatively low, although its bioavailability is high. Low liver reserves of zinc at birth may predispose some infants to zinc deficiency (Zlotkin et al., 1988), similar to the situation for iron. To date there is little evidence that zinc deficiency limits growth of exclusively breastfed infants prior to 6 months of age (though it may do so after 6

months; Brown et al 2002), but recent findings of reduced infectious disease mortality among term, small-for-gestational infants in India given zinc supplements from 1 to 9 months of age (Sazawal et al., 2001) suggest that zinc nutriture in early infancy may be inadequate under certain conditions. As mentioned above for iron, however, medicinal zinc supplements may be more effective than complementary foods at preventing zinc deficiency in young infants.

Vitamin deficiencies are generally rare in exclusively breastfed infants, but when the mothers' diets are deficient, their infants may have low intakes of certain vitamins (such as vitamin A, riboflavin, vitamin B6, and vitamin B12). In these situations, improving the mother's diet or giving her supplements is the recommended treatment, rather than providing complementary foods to the infant. Vitamin D deficiency may occur among infants who do not receive much exposure to sunlight, but giving vitamin D drops directly to the infant generally prevents this.

Given that growth is generally not improved by complementary feeding before six months even under optimal conditions (i.e., nutritious, microbiologically safe foods) and that complementary foods introduced before six months tend to displace breast milk (Cohen et al., 1994; Dewey et al., 1999), the Expert Consultation concluded that the potential health benefits of waiting until six months to introduce other foods outweigh any potential risks. After six months of age, however, it becomes increasingly difficult for breastfed infants to meet their nutrient needs from human milk alone (WHO/UNICEF, 1998). Furthermore, most infants are developmentally ready for other foods at about six months (Naylor and Morrow, 2001). In environments where environmental sanitation is very poor, waiting until even later than 6 months to introduce complementary foods might reduce exposure to food-borne pathogens. However, because infants are beginning to actively explore their environment at this age, they will be exposed to microbial contaminants through soil, etc. even if they are not given complementary foods. Thus, the consensus is that six months is the appropriate age at which to introduce complementary foods.

The Expert Consultation concluded that the potential health benefits of waiting until six months to introduce other foods outweigh any potential risks.

MAINTENANCE OF BREASTFEEDING

A. Guideline: Continue frequent, on-demand breastfeeding until 2 years of age or beyond.

B. Scientific rationale: Breastfeeding continues to make an important nutritional contribution well beyond the first year of life. Breastfed children at 12-23 months of age whose intake is similar to the "average" amount of breast milk consumed at that age (about 550 g/d in developing countries; WHO/UNICEF, 1998) receive 35-40% of total energy needs from breast milk (Dewey and Brown, 2002). Because it has a relatively high fat content compared to most complementary foods, breast milk is a key source of energy and essential fatty acids. Its fat content may be critical for utilization of pro-vitamin A carotenoids in predominantly plant-based diets. Breast milk provides substantial amounts of certain micronutrients. In the Gambia, it is estimated that breast milk provides 70% of vitamin A, 40% of calcium and 37% of riboflavin intake at 15-18 months of age (Prentice and Paul, 1990). The nutritional impact of breastfeeding is most evident during periods of illness, when the child's appetite for other foods decreases but breast milk intake is maintained (Brown et al., 1990). It thus plays a key role in preventing dehydration and providing the nutrients required for recovery from infections.

Continued, frequent breastfeeding also protects child health by delaying maternal fertility postpartum (thereby increasing birth intervals in populations that do not regularly use other forms of contraception) and reducing the child's risk of morbidity and mortality in disadvantaged populations (Molbak et al., 1994; WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality, 2000). Although the impact of breastfeeding past the first year of life on infant appetite and growth has been controversial (Caulfield et al., 1996; Habicht, 2000), recent longitudinal studies demonstrate that in developing countries, a longer duration of breastfeeding is associated with greater linear growth when the data are analyzed appropriately to eliminate the influence of confounding variables and reverse causation (Onyango et al., 1999; Simondon et al, 2001).

Breastfeeding continues to make an important nutritional contribution well beyond the first year of life.

A longer duration of breastfeeding has been linked to reduced risk of childhood chronic illnesses (Davis, 2001) and obesity (Butte, 2001), and to improved cognitive outcomes (Reynolds, 2001), although the causal relationships underlying these associations remain controversial. Most of these studies have not specifically examined the effect of breastfeeding beyond 12 months on these outcomes.

Photo courtesy of: La Leche League, Guatemala



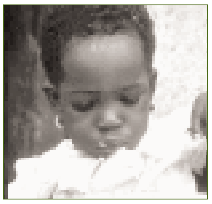
three

RESPONSIVE FEEDING

A. Guideline: Practice responsive feeding, applying the principles of psycho-social care (Engle et al., 2000; Pelto et al., 2002). Specifically: a) feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues; b) feed slowly and patiently, and encourage children to eat, but do not force them; c) if children refuse many foods, experiment with different food combinations, tastes, textures and methods of encouragement; d) minimize distractions during meals if the child loses interest easily; e) remember that feeding times are periods of learning and love - talk to children during feeding, with eye to eye contact.

B. Scientific rationale: There is increasing recognition that optimal complementary feeding depends not only on what is fed, but also on how, when, where, and by whom the child is fed (Pelto et al., 2002). Behavioral studies have revealed that a "laissez-faire" style of feeding predominates in some populations (Engle and Zeitlin, 1996; Bentley et al., 1991; Bentley et al, 1992), with encouragement to eat rarely observed, or observed only when children refused food or were ill. It has been hypothesized that a more active style of feeding may improve dietary intake. The evidence to date on the impact of feeding behaviors on dietary intake and child health is sparse, however. In an urban population in Ghana, Ruel et al. (1999) found that a "care practices" scale (which included breastfeeding patterns, timing of complementary feeding, food quality, and two "active feeding" behaviors) was positively associated with child anthropometric status among mothers with little or no schooling. Several intervention studies that included feeding behaviors as part of the recommended practices have reported positive effects on child growth (Sternin et al., 1997; Creed de Kanashiro et al., 2002), but it is not possible to separate the influence of responsive feeding from that of the other changes that occurred in breastfeeding practices and the types of complementary foods offered. When more data are available from controlled research trials, it may be possible to pinpoint the types of feeding behaviors that make the most difference to child health and behavioral development. In the meantime, the recommendations above represent the current consensus on optimal practices among experts in the field.

Optimal complementary feeding depends not only on *what* is fed, but also on *how, when, where,* and *by whom* the child is fed.





SAFE PREPARATION AND STORAGE OF COMPLEMENTARY FOODS

A. Guideline: Practice good hygiene and proper food handling by a) washing caregivers' and children's hands before food preparation and eating, b) storing foods safely and serving foods immediately after preparation, c) using clean utensils to prepare and serve food, d) using clean cups and bowls when feeding children, and e) avoiding the use of feeding bottles, which are difficult to keep clean (see WHO Complementary Feeding: Family foods for breastfed children, 2000 for additional details).

The peak incidence of diarrheal disease is during the second half year of infancy, as the intake of complementary foods increases. Because they are difficult to keep clean, feeding bottles are a particularly important route of transmission of pathogens.

B. Scientific rationale: Attention to hygienic practices during food preparation and feeding is critical for prevention of gastrointestinal illness. The peak incidence of diarrheal disease is during the second half year of infancy, as the intake of complementary foods increases (Martinez et al., 1992). Microbial contamination of foods is a major cause of childhood diarrhea, and can be prevented by the practices described above. Because they are difficult to keep clean, feeding bottles are a particularly important route of transmission of pathogens. In peri-urban Peru, 35% of bottle nipples tested positive for E. coli, an indicator of fecal contamination, and 31% of teas served in baby bottles were contaminated with E. coli compared with only 2% of teas served in cups (Black et al., 1989).

Although there are significant barriers to compliance with the above recommendations in many settings (including lack of safe water and facilities for safe preparation and storage of food, and time constraints for the caregivers), carefully planned educational interventions can result in substantial improvement (Monte et al., 1997). In addition, use of fermented foods can reduce the risk of microbial contamination (Kimmons et al., 1999) and has the added advantage of improving nutrient content (WHO, 1998).

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Photo courtesy of UNICEF /HQ93-1732/ Roger Lemoyne: Complementary feeding of Chinese infant



five

AMOUNT OF COMPLEMENTARY FOOD NEEDED

A. Guideline: Start at six months of age with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breastfeeding. The energy needs from complementary foods for infants with "average" breast milk intake in developing countries (WHO/UNICEF, 1998) are approximately 200 kcal per day at 6-8 months of age, 300 kcal per day at 9-11 months of age, and 550 kcal per day at 12-23 months of age. In industrialized countries these estimates differ somewhat (130, 310 and 580 kcal/d at 6-8, 9-11 and 12-23 months, respectively) because of differences in average breast milk intake.

B. Scientific rationale: The total energy requirements of healthy, breastfed infants are approximately 615 kcal/d at 6-8 months, 686 kcal/d at 9-11 months, and 894 kcal/d at 12-23 months of age (Dewey and Brown, 2002). Energy needs from complementary foods are estimated by subtracting average breast milk energy intake from total energy requirements at each age. Among breastfed children in developing countries, average breast milk energy intake is 413, 379 and 346 kcal/d at 6-8, 9-11 and 12-23 months, respectively (WHO/UNICEF, 1998). The equivalent values for industrialized countries (for breastfed children only) are 486, 375 and 313 kcal/d, respectively.

The above guideline is based on children receiving average amounts of breast milk at each age. If an infant is consuming more or less breast milk than the average, the amount needed from complementary foods will differ accordingly. In practice, caregivers will not know the precise amount of breast milk consumed, nor will they be measuring the energy content of complementary foods to be offered. Thus, the amount of food to be offered should be based on the principles of responsive feeding (guideline #3), while assuring that energy density and meal frequency are adequate to meet the child's needs (see # 7, below). With the sample diets shown in the document *Complementary feeding: family foods for breastfed children* (WHO, 2000), which have a composite energy density ranging from 1.07 to 1.46 kcal/g, the approximate quantity of complementary foods that would meet the energy needs described above is 137-187 g/d at 6-8 months, 206-281 g/d at 9-11 months, and 378-515 g/d at 12-23 months. [It should be noted, however, that these diets will not always satisfy micronutrient requirements. Recommended intakes of iron, and to a lesser extent zinc, are unlikely to be provided by these diets.] It is important not to be overly prescriptive about the amount of complementary foods to be consumed, recognizing that each child's needs will vary due to differences in breast milk intake and variability in growth rate. Furthermore, children recovering from illness or living in environments where energy expenditure is high may require more energy than the average quantities listed here.



Photo courtesy of: PAHO



FOOD CONSISTENCY

A. Guideline: Gradually increase food consistency and variety as the infant gets older, adapting to the infant's requirements and abilities. Infants can eat pureed, mashed and semi-solid foods beginning at six months. By 8 months most infants can also eat "finger foods" (snacks that can be eaten by children alone). By 12 months, most children can eat the same types of foods as consumed by the rest of the family (keeping in mind the need for nutrient-dense foods, as explained in #8 below). Avoid foods that may cause choking (i.e., items that have a shape and/or consistency that may cause them to become lodged in the trachea, such as nuts, grapes, raw carrots).

When foods of inappropriate consistency are offered, the child may be unable to consume more than a trivial amount, or may take so long to eat that food intake is compromised.

B. Scientific rationale: The neuromuscular development of infants dictates the minimum age at which they can ingest particular types of foods (WHO/UNICEF, 1998). Semi-solid or pureed foods are needed at first, until the ability for "munching" (up and down mandibular movements) or chewing (use of teeth) appears. The ages listed above represent the usual capabilities of normal, healthy infants. When foods of inappropriate consistency are offered, the child may be unable to consume more than a trivial amount, or may take so long to eat that food intake is compromised. Evidence from several sources (Dewey and Brown, 2002) indicates that by 12 months, most infants are able to consume "family foods" of a solid consistency, although many are still offered semi-solid foods (presumably because they can ingest them more efficiently, and thus less time for feeding is required of the caregiver). There is suggestive evidence of a "critical window" for introducing "lumpy" solid foods: if these are delayed beyond 10 months of age, it may increase the risk of feeding difficulties later on (Northstone et al., 2001). Thus, although it may save time to continue feeding semi-solid foods, for optimal child development it is advisable to gradually increase food consistency with age.

MEAL FREQUENCY AND ENERGY DENSITY

A. Guideline: Increase the number of times that the child is fed complementary foods as he/she gets older. The appropriate number of feedings depends on the energy density of the local foods and the usual amounts consumed at each feeding. For the average healthy breastfed infant, meals of complementary foods should be provided 2-3 times per day at 6-8 months of age and 3-4 times per day at 9-11 and 12-24 months of age, with additional nutritious snacks (such as a piece of fruit or bread or chapatti with nut paste) offered 1-2 times per day, as desired. Snacks are defined as foods eaten between meals-usually self-fed, convenient and easy to prepare. If energy density or amount of food per meal is low, or the child is no longer breastfed, more frequent meals may be required.

B. Scientific rationale: The above guideline is based on theoretical estimates of the number of feedings required, calculated from the energy needs from complementary foods (see #5 above), and assuming a gastric capacity of 30 g/kg body weight/d and a minimum energy density of complementary foods of 0.8 kcal/g (Dewey and Brown, 2002). To calculate the minimum meal frequencies shown above (2 at 6-8 months and 3 thereafter), the energy needs from complementary foods were based on age-specific total daily energy requirements plus 2 SD (to meet the needs of almost all children) minus the average intake of energy from breast milk by children in developing countries. Infants with low intakes of breast milk would require the higher meal frequencies shown above (3 at 6-8 months and 4 thereafter) (Table 1).

When energy density of the usual complementary foods is less than 0.8 kcal/g, or infants typically consume amounts that are less than the assumed gastric capacity at each meal, meal frequency would need to be higher than the values shown above (see Table 1). Table 2 shows the minimum energy density of complementary foods at various meal frequencies and levels of breast milk intake.

A meal frequency that is greater than necessary may lead to excessive displacement of breast milk. In Guatemala, a social marketing campaign to promote feeding complementary foods five times per day had the unintended consequence of reducing breastfeeding frequency in children 19-24 months of age (from an average of 6.9 daytime feedings prior to the intervention, to 3.7 daytime feedings after the intervention, p=0.01; Rivera et al., 1998). In addition, preparing and feeding five meals per day requires a considerable amount of time and effort by caregivers, which may prompt them to hold prepared food over from one meal to the next, thereby potentially increasing the risk of microbial contamination. These considerations should be borne in mind when developing messages regarding meal frequency. The use of 1 to 2 nutritious snacks per day, such as a piece of fruit or a piece of bread or chapatti with nut paste, will not require time for preparation and may also be less likely to displace breast milk.



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NUTRIENT CONTENT OF COMPLEMENTARY FOODS

A. Guideline: Feed a variety of foods to ensure that nutrient needs are met. Meat, poultry, fish or eggs should be eaten daily, or as often as possible. Vegetarian diets cannot meet nutrient needs at this age unless nutrient supplements or fortified products are used (see #9 below). Vitamin A-rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content (see Table 3). Avoid giving drinks with low nutrient value, such as tea, coffee and sugary drinks such as soda. Limit the amount of juice offered so as to avoid displacing more nutrient-rich foods.

B. Scientific rationale:

1) *Micronutrient content.* Because of the rapid rate of growth and development during the first two years of life, nutrient needs per unit body weight of infants and young children are very high. Breast milk can make a substantial contribution to the total nutrient intake of children between 6 and 24 months of age, particularly for protein and many of the vitamins. However, breast milk is relatively low in several minerals such as iron and zinc, even after accounting for bioavailability. At 9-11 months of age, for example, the proportion of the Recommended Nutrient Intake that needs to be supplied by complementary foods is 97% for iron, 86% for zinc, 81% for phosphorus, 76% for magnesium, 73% for sodium and 72% for calcium (Dewey, 2001). Given the relatively small amounts of complementary foods that are consumed at 6-24 months (see #5 above), the nutrient density (amount of each nutrient per 100 kcal of food) of complementary foods needs to be very high.

   Calculations of the desired nutrient densities at various ages (6-8, 9-11 and 12-23 months) are published elsewhere (WHO/UNICEF, 1998; Dewey and Brown, 2002). When these were compared with the actual nutrient densities of the typical complementary food diets consumed in various populations, several "problem nutrients" were identified. In most developing countries, complementary foods do not provide sufficient iron, zinc and vitamin B6. Even in the U.S., iron and zinc were identified as problem nutrients in the first year of life, despite the availability of iron-fortified products. Certain nutrients are in short supply in some populations, but not in all, depending on the local mix of complementary foods. These include riboflavin, niacin, thiamin, folate, calcium, vitamin A and vitamin C. Others, such as vitamin E, iodine and selenium, may also be problem nutrients in certain settings, but there is insufficient information to make this judgment.

   Because there is so much variability in complementary food diets in different parts of the world, it is not feasible to provide global dietary "prescriptions" that would guarantee adequate intake of all essential nutrients. It is preferable to develop population-specific dietary guidelines for complementary foods based on the food composition of locally available foods. However, it is clear from analyses done previously (WHO/UNICEF, 1998; Gibson et al., 1998; Dewey and Brown, 2002) that plant-based complementary foods by them-

selves are insufficient to meet the needs for certain micronutrients. Therefore, it is advisable to include meat, poultry, fish or eggs in complementary food diets as often as possible. Dairy products are a good source of some nutrients, such as calcium, but do not provide sufficient iron unless they are fortified. In environments with poor sanitation, promotion of liquid milk products is risky because they are easily contaminated, especially when fed by bottle. Fresh, unheated cow's milk consumed prior to 12 months of age is also associated with fecal blood loss and lower iron status (Ziegler et al., 1990; Griffin and Abrams, 2001). For these reasons it may be more appropriate during the first year of life to choose dairy products such as cheese, yogurt and dried milk (mixed with other foods, e.g. in a cooked porridge).

Potential allergic reactions related to consumption of certain high-protein foods during infancy have been a concern in some industrialized countries (food allergies appear to be less common in developing countries). For example, the American Academy of Pediatrics recommends that infants with a family history of allergies or food sensitivities should not receive cow's milk until 1 year of age, eggs until 2 years, and peanuts, nuts and fish until 3 years of age (AAP, 1998). It is thought that avoidance of foods with documented allergenic potential may delay or prevent some food allergy and atopic dermatitis in high-risk infants. However, controlled studies demonstrating that restrictive diets after 6 months of age have an allergy-preventing effect have not been published (Halken and Host, 2001), and for this reason no such restrictions were advised by an international group of experts (WHO/IAACI, 2000).

The advice to provide vitamin A-rich fruits and vegetables daily is based on the clear health benefits associated with preventing vitamin A deficiency (Allen and Gillespie, 2001), and the likelihood that consumption of such foods will also help meet the needs for many of the other vitamins. More precise guidelines regarding the recommended amount and frequency of consumption of such foods can be developed using local food composition data.



2) *Fat content.* Fat is important in the diets of infants and young children because it provides essential fatty acids, facilitates absorption of fat soluble vitamins, and enhances dietary energy density and sensory qualities. Breast milk is generally a more abundant source of fat than most complementary foods. Thus, total fat intake usually decreases with age as the contribution of breast milk to total dietary energy declines. Although there is debate about the optimal amount of fat in the diets of infants and young children, the range of 30-45% of total energy has been suggested (Dewey and Brown, 2002; Bier et al., 1999) as a reasonable compromise between the risks of too little intake (such as inadequate essential fatty acids and low energy density) and excessive intake (thought to potentially increase the likelihood of childhood obesity and future cardiovascular disease, although the evidence on this point is limited [Milner and Allison, 1999]). The percentage of energy from fat in complementary foods that would be needed to achieve a level of 30-45% of energy from fat in the total diet depends on the level of breast milk intake and the fat content of the breast

milk (Dewey and Brown, 2002). For infants in developing countries consuming an average amount of breast milk with a normal fat concentration (38 g/L), for example, the needed percentage of energy from fat in complementary foods is 0-34% at 6-8 months, 5-38% at 9-11 months, and 17-42% at 12-23 months (see Table 3).

When developing dietary guidelines to provide adequate fat in complementary foods, it is important to take into account the potential effect of added fat (such as oil mixed with porridge) on the overall nutrient density of the diet. For example, the addition of one teaspoon of vegetable oil to 100 g of a typical maize pap used in West Africa would increase the energy density from 0.28 to 0.73 kcal/g, but would reduce protein density from 8.9% to 3.3% of energy, and iron density from 0.5 to 0.2 mg/100 kcal (WHO/UNICEF, 1998). These effects could exacerbate micronutrient malnutrition in vulnerable populations unless other measures (such as fortification) are taken to ensure adequate micronutrient intake.

Sugary drinks, such as soda, should be avoided because they contribute little other than energy, and thereby decrease the child's appetite for more nutritious foods.

3) *Beverages with low nutrient value.* Tea and coffee contain compounds that can interfere with iron absorption (Allen and Ahluwalia, 1997), and thus are not recommended for young children. Sugary drinks, such as soda, should be avoided because they contribute little other than energy, and thereby decrease the child's appetite for more nutritious foods. Excessive juice consumption can also decrease the child's appetite for other foods, and may cause loose stools. For this reason, the American Academy of Pediatrics (1998) recommends no more than 240 ml of fruit juice per day. Studies in the U.S. have linked excess fruit juice consumption to failure to thrive (Smith and Lifshitz, 1994) and to short stature and obesity (Dennison et al., 1997), although such outcomes have not been consistently observed (Skinner et al., 1999).

USE OF VITAMIN-MINERAL SUPPLEMENTS OR FORTIFIED PRODUCTS FOR INFANT AND MOTHER

A. Guideline: Use fortified complementary foods or vitamin-mineral supplements for the infant, as needed. In some populations, breastfeeding mothers may also need vitamin-mineral supplements or fortified products, both for their own health and to ensure normal concentrations of certain nutrients (particularly vitamins) in their breast milk. [Such products may also be beneficial for pre-pregnant and pregnant women].

B. Scientific rationale: Unfortified complementary foods that are predominantly plant-based generally provide insufficient amounts of certain key nutrients (particularly iron, zinc and calcium) to meet the recommended nutrient intakes during the age range of 6-24 months (WHO/UNICEF, 1998; Gibson et al., 1998; Dewey and Brown, 2002). Inclusion of animal-source foods can meet the gap in some cases, but this increases the cost and thus may not be practical for the lowest income groups. Furthermore, the amounts of animal-source foods that can feasibly be consumed by infants (e.g., at 6-12 months) are generally insufficient to meet the gaps in iron, calcium and sometimes zinc (WHO/UNICEF, 1998). Gibson et al. (1998) evaluated 23 different complementary food mixtures used in developing countries, some of which included animal-source foods. None of them achieved the desired iron density and few achieved the desired calcium or zinc density. The difficulty in meeting the needs for these nutrients during infancy is not unique to developing countries. Average iron intakes of breastfed infants in industrialized countries would fall well short of the recommended intake if iron-fortified products were not available (WHO/UNICEF, 1998), and the median zinc density of complementary foods consumed by breastfed infants in the U.S. was below the desired density at 6-12 months (Dewey and Brown, 2002).

In industrialized countries, iron-fortified complementary foods have been widely consumed for decades, and some manufacturers have added zinc as a fortificant in recent years. Such products are not as widely available in developing countries (except through social programs that reach only a small proportion of the population), although there is increasing attention to this strategy for ensuring adequate infant nutrition (Lutter, 2000; Lutter in press). An alternative to food fortification is the use of vitamin-mineral supplements that are provided directly to the infant (e.g. as medicinal drops) or mixed with complementary foods (e.g. “sprinkles”, or fat-based spreads; Dewey and Brown, 2002). Evaluation of the nutrient shortfalls for a particular population (based on the types of complementary foods consumed) is necessary to decide whether single or multiple-micronutrient fortification or supplementation is appropriate.

As described in #1, above, maternal malnutrition can affect the concentrations of certain nutrients in breast milk (particularly the vitamins). Improvement of the mother’s diet is normally the first choice, but when this is insufficient, consumption of fortified products or vitamin-mineral supplements during lactation can help ensure adequate nutrient intake by the infant and enhance the mother’s nutritional status (Huffman et al., 1998).

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FEEDING DURING AND AFTER ILLNESS

A. Guideline: Increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, varied, appetizing, favorite foods. After illness, give food more often than usual and encourage the child to eat more.

B. Scientific rationale: During illness, the need for fluids is often higher than normal. Sick children appear to prefer breast milk to other foods (Brown et al., 1990), so continued, frequent breastfeeding during illness is advisable. Even though appetite may be reduced, continued consumption of complementary foods is recommended to maintain nutrient intake and enhance recovery (Brown, 2001). After illness, the child needs greater nutrient intake to make up for nutrient losses during the illness and allow for catch-up growth. Extra food is needed until the child has regained any weight lost and is growing well again.

Continued, frequent breastfeeding during illness is advisable.



Photo courtesy of UNICEF /HQ97-1377/ Giacomo Pirozzi: Nigerian mother feeding her child during illness



USE OF THE GUIDING PRINCIPLES

The current scientific evidence for complementary feeding of the breastfed child is summarized in these Guiding Principles. The length of the scientific rationale for each guideline varies considerably, because of differences in the knowledge base and complexity of the recommendation. Research is needed on a number of topics to improve this knowledge base as well as to provide information on how to translate this knowledge into effective policies and programs in different settings. However, given the importance of infant and young child nutrition for adequate physical and cognitive development and the critical window of opportunity during the first two years of life to ensure a healthy start to life, the available knowledge base was considered sufficiently robust to develop this set of guidelines.

The Guiding Principles are intended to guide policy and programmatic action at global, national, and community levels. Their implementation will require additional research in most settings to identify culturally acceptable and affordable foods that can be promoted in meal preparation and as snacks, identify factors that facilitate or are barriers to adopting improved feeding behaviors by caregivers and families, and translate each guideline into specific messages that are understood by health care providers, mothers, and other caregivers.

In applying each guideline, there are potential assessment needs and many potential actions that can be undertaken, which may vary with the specific setting (for examples, see Table 4). Whenever possible, these assessment needs and potential actions should be defined when implementing the Guiding Principles. For example, for the first Guideline "Duration of exclusive breastfeeding and age of introduction of adequate complementary foods", assessment needs at the national level could include the identification of barriers to exclusive breastfeeding, employment rates and maternity leave legislation, and current policies and programs to protect, promote, and support breastfeeding and the timely introduction of complementary foods. Potential actions could include support and expansion of the Baby Friendly Hospital Initiative, implementation and enforcement of the International Code of Marketing of Breast-milk Substitutes, adoption and enforcement of adequate maternity leave legislation, routine breastfeeding counseling at all prenatal and post-partum visits and during hospitalization for childbirth, etc. Many of these assessment needs and potential actions would also be applicable to implementation of these Guiding Principles at the local level.

The adoption by mothers of optimal breastfeeding and by mothers/caregivers of optimal complementary feeding practices is needed to ensure appropriate infant and young child growth and development. Although maternal/caregiver decisions ultimately determine how an infant and young child is fed, these decisions do not occur in isolation but rather reflect the immediate and overall environment in which they are made and carried out. The Guiding Principles for Complementary Feeding of the Breastfed Child are intended to provide to a wide range of individuals--policy makers, program planners, health care providers, and community leaders--scientifically-based information necessary to promote a conducive environment and to develop culturally appropriate messages for optimal infant and young child feeding.

The adoption by mothers of optimal breast-feeding and by mothers/caregivers of optimal complementary feeding practices is needed to ensure appropriate infant and young child growth and development.

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Table 1. Minimum number of meals required to attain the level of energy needed from complementary foods with mean energy density of 0.6, 0.8, or 1.0 kcal/g for children in developing countries with low or average levels of breast milk energy intake (BME), by age group

Energy density (kcal/g)	Age group 6-8 mo		9-11 mo		12-23 mo	
	LOW BME	AVG BME	LOW BME	AVG BME	LOW BME	AVG BME
0.6	3.7	2.4	4.1	2.8	5.0	3.7
0.8	2.8	1.8	3.1	2.1	3.7	2.8
1.0	2.2	1.4	2.5	1.7	3.0	2.2

- *Estimated total energy allowance (see Dewey and Brown, 2002) is based on average requirement plus 25% (2 SD), to meet the needs of 97.5% of the population. Assumed functional gastric capacity (30 g/ kg reference BW) is 249 g/meal at 6-8 mo, 285 g/meal at 9-11 mo, and 345 g/meal at 12-23 mo.*
- *Low BME: 217 kcal/d at 6-8 mo, 157 kcal/d at 9-11 mo, and 90 kcal/d at 12-23 mo (WHO/UNICEF, 1998)*
- *Average BME: 413 kcal/d at 6-8 mo, 379 kcal/d at 9-11 mo, and 346 kcal/d at 12-23 mo (WHO/UNICEF, 1998)*

Table 2. Minimum dietary energy density (kcal/g) required to attain the level of energy needed from complementary foods in 2-5 meals/d by children in developing countries with low or average level of breast milk energy intake (BME)

Energy density (kcal/g)	Age group 6-8 mo		9-11 mo		12-23 mo	
	LOW BME	AVG BME	LOW BME	AVG BME	LOW BME	AVG BME
2	1.11	0.71	1.23	0.84	1.49	1.12
3	0.74	0.48	0.82	0.56	0.99	0.75
4	0.56	0.36	0.61	0.42	0.74	0.56
5	0.44	0.26	0.49	0.34	0.60	0.45

- *Estimated total energy allowance (see Dewey and Brown, 2002) is based on average requirement plus 25% (2 SD), to meet the needs of 97.5% of the population. Assumed functional gastric capacity (30 g/ kg reference BW) is 249 g/meal at 6-8 mo, 285 g/meal at 9-11 mo, and 345 g/meal at 12-23 mo.*
- *Low BME: 217 kcal/d at 6-8 mo, 157 kcal/d at 9-11 mo, and 90 kcal/d at 12-23 mo (WHO/UNICEF, 1998)*
- *Average BME: 413 kcal/d at 6-8 mo, 379 kcal/d at 9-11 mo, and 346 kcal/d at 12-23 mo (WHO/UNICEF, 1998)*

Table 3. Percentage of energy from complementary foods that should be provided as fat to prepare diets with 30% or 45% of total energy as fat, for children in developing countries, by age group and level of breast milk energy intake

Percent of total dietary energy as fat	Level of breast milk energy intake	Age group 6-8 mo	9-11 mo	12-23 mo
30	Low	19	24	28
	Med	0	5	17
	High	0	0	0
45	Low	42	43	44
	Med	34	38	42
High	0	7	34	

- *Total energy requirement is based on estimates shown in Dewey and Brown, 2002. Assumes well nourished mothers with milk fat concentrations of 38 g/L and breast milk energy density of 0.68 kcal/g.*
- *Low BME: 217 kcal/d at 6-8 mo, 157 kcal/d at 9-11 mo, and 90 kcal/d at 12-23 mo (WHO/UNICEF, 1998)*
- *Average BME: 413 kcal/d at 6-8 mo, 379 kcal/d at 9-11 mo, and 346 kcal/d at 12-23 mo (WHO/UNICEF, 1998)*
- *High BME: 609 kcal/d at 6-8 mo, 601 kcal/d at 9-11 mo, and 602 kcal/d at 12-23 mo (WHO/UNICEF, 1998)*

Table 4. Potential assessment needs and actions

Guiding principle	Assessment needs	Potential actions
1. Duration of exclusive breastfeeding (EBF) and age of introduction of complementary foods	❖ Current policies and programs to protect, promote and support breastfeeding (BF) and timely introduction of complementary foods ❖ Barriers to EBF ❖ Employment rates of women in the first year postpartum and maternity leave legislation	❖ Implement and enforce the International Code of Marketing of Breastmilk Substitutes ❖ Ensure that relevant standards for the Codex Alimentarius include age of introduction of complementary foods ❖ Adopt and enforce regulation providing adequate maternity leave ❖ Support and expand BFHI ❖ Provide training on infant and young child feeding (IYCF) counseling to health care professionals ❖ Implement social marketing campaigns to promote appropriate IYCF practices ❖ Ensure that educational materials provide guidance on appropriate IYCF practices ❖ Facilitate and expand activities of community support for appropriate IYCF practices ❖ Develop and support worksite lactation programs
2. Maintenance of BF	❖ Barriers to sustained frequent BF ❖ Wording of educational material with respect to the term “weaning”	❖ As above
3. Responsive feeding	❖ Constraints on infant appetite or food intake – if total energy intake is low, investigate whether this is due to frequent illness, micronutrient deficiency, inappropriate consistency of foods, unresponsive feeding by caregiver, or household food insecurity ❖ Feeding skills and behaviours of the caregivers	❖ Conduct trials for improved feeding practices to identify current feeding behaviours of caregivers and ways to improve these behaviours ❖ Provide training on IYCF counselling to health care professionals ❖ Implement social marketing campaigns to promote appropriate IYCF practices ❖ Ensure that educational materials provide guidance on appropriate IYCF practices ❖ Facilitate and expand activities of community support for appropriate IYCF practices ❖ Counsel and educate caregivers regarding appropriate IYCF practices
4. Safe preparation and storage of complementary foods	❖ Adequacy and safety of water supply ❖ Availability of fuel for cooking and appropriate storage of perishables ❖ Current hygienic practices, use of feeding bottles or cups ❖ Current use of fermented foods for infants and young children	❖ Implement programs to improve water quality and sanitation ❖ When fuel is limiting, develop alternative low-cost options ❖ Promote use of fermented complementary foods ❖ When refrigeration is limited, investigate feasibility and effectiveness of strategies such as use of vacuum flasks for storage of prepared foods ❖ Implement social marketing campaigns to promote safe preparation and storage of foods ❖ Implement and enforce the International Code of Marketing of Breastmilk Substitutes

Guiding principle	Assessment needs	Potential actions
5. Amount of complementary foods needed	❖ Food security of the target population, including seasonal shortages ❖ Typical amounts of complementary foods provided and consumed	❖ Conduct trials for improved feeding practices to identify locally feasible, acceptable and affordable recipes for infants and young children ❖ Develop age-specific feeding recommendations based on local recipes ❖ Provide training on IYCF counselling to health care professionals ❖ Facilitate and expand activities of community support for appropriate IYCF practices ❖ Counsel and educate caregivers regarding appropriate IYCF practices ❖ Ensure that educational materials contain accurate and consistent messages regarding IYCF ❖ Implement social marketing campaigns to promote appropriate IYCF practices ❖ Implement and enforce the International Code of Marketing of Breastmilk Substitutes
6. Food consistency	❖ Types of foods usually fed, method of preparation, and consistency ❖ Beliefs regarding appropriate foods for infants ❖ As above ❖ Promote home or community based food technologies to improve consistency of staple foods	❖ As above ❖ Promote home or community based food technologies to improve consistency of staple foods
7. Meal frequency and energy density	❖ Feeding frequency and energy density of local foods. ❖ Local barriers to feeding children according to the guidelines, including constraints on working women	❖ As above
8. Nutrient content of CF	❖ Capacity of locally available foods to meet nutrient needs ❖ Current practices and barriers regarding use of animal-source foods, vitamin A-rich fruits and vegetables ❖ Local fat sources and under- or over-use of fat ❖ Use of tea, coffee, sugary drinks and juices	❖ As above ❖ Develop and adopt feasible dietary guidelines to improve nutrient content of complementary foods, through promotion of home-based food technologies, fortification or, if needed, supplementation ❖ Ensure that relevant standards of the Codex Alimentarius are applied in the production and marketing of commercially prepared complementary foods
9. Use of vitamin-mineral supplements or fortified products for infants and mother	❖ Gaps in meeting nutrient needs of infants using local foods ❖ Prevalence of maternal and child micronutrient deficiencies ❖ Current use of fortified foods and nutrient supplements, for infants and for lactating women ❖ Demand for convenient processed foods and potential to pay for them	❖ Determine lowest-cost, most feasible strategy for filling nutrient gaps, through fortified foods, nutrient supplements, or a combination ❖ Work with local companies to produce fortified foods and/or supplements and develop a marketing strategy ❖ Consider subsidizing such products for low-income families
10. Feeding during and after illness	❖ Traditional food practices during illness, such as withholding of food, use of specific foods or fluids ❖ Knowledge of caregivers regarding food and fluid needs during illness, and the concept of catch-up growth	❖ Conduct trials for improved feeding practices to identify current feeding behaviours and feasible, acceptable ways to improve child feeding during and after illness ❖ Counsel caregivers regarding appropriate IYCF practices during and after illness

GUIDING PRINCIPLES FOR COMPLEMENTARY FEEDING OF THE BREASTFEED CHILD

1. **DURATION OF EXCLUSIVE BREASTFEEDING AND AGE OF INTRODUCTION OF COMPLEMENTARY FOODS.** Practice exclusive breastfeeding from birth to 6 months of age, and introduce complementary foods at 6 months of age (180 days) while continuing to breastfeed.

2. **MAINTENANCE OF BREASTFEEDING.** Continue frequent, on-demand breastfeeding until 2 years of age or beyond.

3. **RESPONSIVE FEEDING.** Practice responsive feeding, applying the principles of psycho-social care. Specifically: a) feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues; b) feed slowly and patiently, and encourage children to eat, but do not force them; c) if children refuse many foods, experiment with different food combinations, tastes, textures and methods of encouragement; e) minimize distractions during meals if the child loses interest easily; f) remember that feeding times are periods of learning and love - talk to children during feeding, with eye to eye contact.

4. **SAFE PREPARATION AND STORAGE OF COMPLEMENTARY FOODS.** Practice good hygiene and proper food handling by a) washing caregivers' and children's hands before food preparation and eating, b) storing foods safely and serving foods immediately after preparation, c) using clean utensils to prepare and serve food, d) using clean cups and bowls when feeding children, and e) avoiding the use of feeding bottles, which are difficult to keep clean.

5. **AMOUNT OF COMPLEMENTARY FOOD NEEDED.** Start at 6 months of age with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breast-feeding. The energy needs from complementary foods for infants with "average" breast milk intake in developing countries are approximately 200 kcal per day at 6-8 months of age, 300 kcal per day at 9-11 months of age, and 550 kcal per day at 12-23 months of age. In industrialized countries these estimates differ somewhat (130, 310 and 580 kcal/d at 6-8, 9-11 and 12-23 months, respectively) because of differences in average breast milk intake.

6. **FOOD CONSISTENCY.** Gradually increase food consistency and variety as the infant gets older, adapting to the infant's requirements and abilities. Infants can eat pureed, mashed and semi-solid foods beginning at six months. By 8 months most infants can also eat "finger foods" (snacks that can be eaten by children alone). By 12 months, most children can eat the same types of foods as consumed by the rest of the family (keeping in mind the need for nutrient-dense foods, as explained in #8 below). Avoid foods that may cause choking (i.e., items that have a shape and/or consistency that may cause them to become lodged in the trachea, such as nuts, grapes, raw carrots).

7. **MEAL FREQUENCY AND ENERGY DENSITY.** Increase the number of times that the child is fed complementary foods as he/she gets older. The appropriate number of feedings depends on the energy density of the local foods and the usual amounts consumed at each feeding. For the average healthy breastfed infant, meals of complementary foods should be provided 2-3 times per day at 6-8 months of age and 3-4 times per day at 9-11 and 12-24 months of age, with additional nutritious snacks (such as a piece of fruit or bread or chapatti with nut paste) offered 1-2 times per day, as desired. Snacks are defined as foods eaten between meals-usually self-fed, convenient and easy to prepare. If energy density or amount of food per meal is low, or the child is no longer breastfed, more frequent meals may be required.

8. **NUTRIENT CONTENT OF COMPLEMENTARY FOODS.** Feed a variety of foods to ensure that nutrient needs are met. Meat, poultry, fish or eggs should be eaten daily, or as often as possible. Vegetarian diets cannot meet nutrient needs at this age unless nutrient supplements or fortified products are used (see #9 below). Vitamin A-rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content. Avoid giving drinks with low nutrient value, such as tea, coffee and sugary drinks such as soda. Limit the amount of juice offered so as to avoid displacing more nutrient-rich foods.

9. **USE OF VITAMIN-MINERAL SUPPLEMENTS OR FORTIFIED PRODUCTS FOR INFANT AND MOTHER.** Use fortified complementary foods or vitamin-mineral supplements for the infant, as needed. In some populations, breastfeeding mothers may also need vitamin-mineral supplements or fortified products, both for their own health and to ensure normal concentrations of certain nutrients (particularly vitamins) in their breast milk. [Such products may also be beneficial for pre-pregnant and pregnant women].

10. **FEEDING DURING AND AFTER ILLNESS.** Increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, varied, appetizing, favorite foods. After illness, give food more often than usual and encourage the child to eat more.

GUIDING PRINCIPLES FOR COMPLEMENTARY FEEDING OF THE BREASTFED CHILD

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